





## ANGINA PECTORIS.<sup>1</sup>

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My first duty is to give expression to the natural feeling of gratification which has been aroused in my mind by the flattering invitation conveyed by the kindness of my friend and your teacher to address you. Such international courtesies seem to me of great value from every point of view. Inter-course with observers in other countries enlarges our knowledge, while it widens our sympathies, and the solidarity of modern science is increased by free interchange of ideas. To myself it is an honour, as it is a pleasure, to be requested to visit your interesting country, with which my own has for many centuries had close bonds of union. Such feelings are certain to arise in the mind of anyone belonging to an academic circle, especially when connected with Edinburgh. For many years the illustrious Hermann Boerhaave has been one of my medical heroes, and it is a matter of the greatest interest to remember that, when he was an undergraduate at Leyden, the celebrated Archibald Pitcairne was Professor of Medicine in that famous University. That my distinguished fellow-countryman should have played the part of Mentor to the Telemachus of your still greater compatriot is certainly a matter of deep interest to us in the British Isles.

These reflections, however, take us back to the period when scientific medicine was only in its dawn; in our own era there are abundant reasons for vivid interest in the medical world of the Netherlands. To anyone who, like myself, has been engaged for years in the study of circulatory phenomena, your country holds out some names of world-wide fame. It is only necessary to mention the exhaustive physiological

<sup>1</sup> An address delivered in the Medical Clinique of the University of Groningen.

investigations of Engelmann, Hoorweg and Einthoven, which have added new lustre to the ancient universities which they have adorned, and the illuminating clinical researches of Stokvis, Wenckebach and van den Bergh, which have crowned your medical schools with imperishable laurels. Above all, my friendly relations with your own distinguished teacher render my appearance on this occasion particularly gratifying.

The subject to which my attention has been requested for this lecture is angina pectoris, especially in the light of some recent extensions of our knowledge of the affection. Before entering upon the consideration of the subject, let me mention the singular fact that angina pectoris appears to be much less common in the Netherlands than in the British Isles. Professor Wenckebach informs me that this is the case as regards every variety of the condition. It is not easy to account for this difference in distribution. The inhabitants of the two countries are certainly blood relations in a very close degree. Both nations are endowed with a great amount of energy, mental and physical, and their habits are not widely dissimilar. The use of tobacco is at least as great on the east side of the North sea as on the west, and the inhabitants of both countries imbibe freely of alcohol; it seems to me, nevertheless, that in the abuse of alcohol my countrymen are greater enemies than you are, especially north of the Tweed, where—to borrow the sardonic phrase of rough old Samuel Johnson<sup>1</sup>—the people are “without skill in inebriation.”<sup>2</sup> In saying this, I am undoubtedly in antagonism to the opinion expressed by the ingenuous Burton.<sup>3</sup> Nevertheless, it seems to me that the opinion which has just been expressed is correct. Again in both countries hard work is the general rule. Possibly the strenuous life has more followers in the United Kingdom than in the Netherlands. When we give full weight to all these considerations, it must be allowed that no sufficient

<sup>1</sup> Boswell: *The Life of Samuel Johnson, LL.D.* Edit. 1826. London. Vol. II. p. 370.

<sup>2</sup> It is probable that the oppressive sumptuary regulations, under which labour in our northern kingdom, have much to do with the deplorable result which we see, and it cannot be gainsaid that recent experiences in the Mode Athens prove that the extent of drunkenness, with its attendant evils, is directly proportional to the stringency of our licensing laws.

<sup>3</sup> *The Anatomy of Melancholy*, viii. Edit. 1676. London. Part I., section number 2, subsection 2, p. 44.

reason can be adduced for the comparative immunity of your fellow countrymen from angina pectoris.

My remarks upon this interesting subject will be mostly clinical, and will be especially directed, in accordance with the request which has been made to me, to some symptoms which have recently attracted my attention for the first time. It is inevitable that some reference must be made to the ætiology and pathology of the conditions underlying the complex of symptoms we have to consider, but this will be done as briefly as possible.

The great fact in angina pectoris is the existence of pain, or some analogous subjective result of sensory disturbance ; around this predominant symptom the attendant phenomena are variously grouped. The uneasy sensation has its principal seat in the præcordia, and usually, but not invariably, extends thence in different directions. Most typically it radiates towards one or both of the shoulders and arms—to the left, when the cardiac disturbance is mostly connected with the left side of the heart ; to the opposite side when the right heart is chiefly involved ; to both sides if the heart is bilaterally affected. Very frequently the discomfort affects the region of the angle of the scapula, where indeed it sometimes seems to attain its greatest intensity. The pain often reaches the fingers, affecting especially the ring and little fingers of the left hand. Sometimes but not nearly so often, it extends up the neck to the back of the head, and occasionally it may pass down to the trunk and even reach the toes of one or other of the lower extremities. We shall afterwards see the reason for such facts of distribution, but let me in this place mention, in passing, that the pain of biliary colic and renal colic, and even of pulmonary congestion or hepatic congestion, has the same tendency to radiate.

The character of the uneasiness and the intensity of the suffering vary enormously. Time would fail me to give you details of the different varieties which are presented ; suffice it to say in a single word that there is a complete gradation from vague uneasiness to intolerable anguish.

As regards the occurrence of the chief symptom, one of its predominant characteristics is the paroxysmal mode of onset. The first attack has undoubtedly often proved fatal, but it is



common to find repeated paroxysms separated by intervals absolutely free from symptoms; in almost every case, however, the patient has constant uneasiness varied by attacks of greater severity. An important point is that the paroxysms are apt to be induced by exertion, whether muscular, intellectual, or emotional, as well as by digestive conditions. We must not make too much of this generally recognised fact, however, for many cases are on record, in which the symptoms have been most urgently present during the night. Although a certain amount of weight must be allowed to the commonly accepted belief that the incidence of an anginous attack after effort of any kind is significant of the graver varieties of the affection, there are, nevertheless, so many exceptions that any rule based on such a conception would be as unwise as it would be misleading. Many other subjective sensations attend the painful feelings, such as faintness and giddiness, tightness and breathlessness, weakness and unsteadiness. The prospect of impending death has been recognised since the early days of our knowledge of angina pectoris, and certainly it is often met with. Many of these sensations can be modified, or even removed, by change of posture and by deep inspiration, but at times the influence of the subjective disturbance is so overwhelming as to prevent any efforts of either kind for fear of increasing the distress. It is generally found that, when the sufferer takes his courage in both hands and alters his position, or draws some deep breaths, he to some extent relieves his symptoms. Patients occasionally complain of weakness of the muscles on the affected side, and this weakness is necessarily found chiefly in the muscles of the upper extremity; they further complain occasionally of tenderness over the areas to which subjective pain is referred. To both of these points further reference will be made.

Turning to the objective aspect of angina pectoris, it may be said that the general appearance of the patient may present the widest variation. From deathly pallor to intense cyanosis showing an attitude of statuesque immobility, or contortions of intolerable agony; with the skin dry and shrivelled, or with the surface bedewed with drops of perspiration; having an expression which may betoken lively curiosity or gloomy apprehension—patients manifesting all these appearances have

been seen by those of us who have had the misfortune to see much of this fell disorder. The wide divergences observed cannot be matter for wonder, seeing that the affection is variable in its severity, and the characteristics of the sufferer may be widely different. On closer examination, the pulse is found to yield information of the most widely divergent kind. The arteries may be healthy or sclerosed; the pressure may be low or high; the rhythm may be regular or otherwise; and the rate may be diminished or increased. In regard to these matters, it is probable that some discrepancies which have occurred are due to difficulties of observation, seeing that the physician necessarily abstains as much as possible from disturbing a patient during a period of suffering. But it has fallen to my lot to be able on many occasions to measure the pressure accurately with the sphygmomanometer, and even to take tracings with the sphygmograph during an attack, and the varieties just mentioned have all been recorded.

At times the veins of the neck may be seen standing out like knotted cords, or wildly pulsating, but in the cases based upon aortic valvular lesions, the arterial pulsation dominates all the cervical features. There is often evidence on inspection, palpation, and percussion, of increase in the size of the heart. The sounds may be largely obscured by murmurs, particularly in those cases of aortic valve disease just referred to. But at other times they are clear and ringing, or low and muffled, according as dilatation or hypertrophy is in the ascendant. Undoubtedly there is evidence in many cases that the heart is struggling to overtake an obstacle, and frequently of its failure to do so. Over the painful areas there is usually hyperæsthesia, the importance of which has been so thoroughly shown by Mackenzie<sup>1</sup> and Head.<sup>2</sup> It may be tested by every means which we employ for the estimation of sensibility, and is almost invariably found to show exaltation to every kind of stimulus. But a different state of matters occasionally prevails. After hyperæsthesia has existed for some time it is succeeded by anæsthesia, which, like the preceding exaltation, is found as regards all kinds of stimuli. Very often there is tenderness of the intercostal and cervical muscles with contraction.

<sup>1</sup> *Medical Chronicle*, 1892, Vol. XVI., p. 293; and *Lancet*, 1895, Vol. I., p. 16.

<sup>2</sup> *Brain*, 1893, Vol. XVI., p. 1; and 1894, Vol. XVII., p. 339.

During recent years several instances have been under my notice in which there were further objective appearances of reflex disturbance brought about through the nervous system. To some of these, confessedly rarer than the symptoms just mentioned, attention was directed by me during last year.<sup>1</sup> Prominence of the left eyeball, with retraction of the eyelid, and dilatation of the pupil, were seen by me recently in a most interesting patient. In this case, along with intense hyperæsthesia over the left half of the chest and the outer aspect of the left arm, there was absolute anæsthesia of the radial half of the hand, both on the palmar and dorsal aspects. There was also weakness of all the muscles of the left arm and forearm, particularly of those on the outer and radial sides. All the muscles affected were flabby in tone; the power of grasping was almost entirely lost; but the muscular response both to mechanical and electric stimuli was increased. On measuring the muscles they were considerably reduced in size. Since the publication of my interesting case a remarkable instance of angina pectoris, with lichen planus over the area of distribution of the intercosto-humeral nerve, where the pain was situated, was described by Gasne and Chiray.<sup>2</sup> As is well known, the secretions often undergo modification. An abundant flow of urine is common, and increase of saliva is at times also observed.

To have a basis for the explanation of these widespread symptoms, we must turn briefly to the nervous connections between the circulatory organs and the nerve centres. The afferent impulses passing to the centres in connection with the inhibiting and dilating mechanism proceed by way of the vagus nerve. The afferent impulses of the accelerating and constricting mechanism have their course by the inferior cardiac nerve to the inferior cervical ganglion, and thence by the grey rami to the seventh and eighth cervical segments of the cord whence they pass by the annulus of Vieussens to the upper thoracic segments. There is, however, no experimental proof of afferent nerves arising in the heart and reaching the spinal cord. Judging afferent nerves of the visceral system by those belonging to the abdomen, they are always medullated up to

<sup>1</sup> *Brain*, 1905, Vol. XXVIII., p. 52

<sup>2</sup> *Gazette des Hôpitaux*, 1905, p. 463.



the posterior ganglion. It might reasonably be expected that the afferent cardiac nerves must also be medullated; but the nerves between the heart and the annulus of Vieussens are non-medullated. It is probable that the spinal heart nerves are a special example of the vaso-constrictor nerves, and, if the blood vessels possess afferent nerves, the heart, in virtue of its connection with the vaso-constrictor system, must have such nerves. There is evidence of the possession of spinal afferent nerves by the blood vessels, although there is no proof that the blood vessels have any medullated fibres. On the whole it is probable that afferent nerves connected at least with the coronary vessels should accompany the accelerator, and thus account for the clinical facts.

Passing from the receptive end organs, whether of the heart or of the great vessels, by the cardiac nerves to the cervical ganglia of the sympathetic, the impulses enter the spinal cord by the grey rami communicantes, and thence run upwards in the ascending tracts of the spinal cord. In the cortex cerebri the effects produced give rise to sensation, but, as Head<sup>1</sup> puts it, "the sensory and localising power of the surface of the body is enormously in excess of that of the viscera, and thus, by what might be called a psychical error of judgment, the diffusion area is accepted by consciousness, and the pain is referred on to the surface of the body instead of on to the organ actually affected." The result in angina pectoris is that the patient feels uneasy or painful sensations over the præcordia, shoulder and upper extremity. In the interesting case which has been described there can be no doubt of the fact that the cervical sympathetic nerve is involved. The ocular phenomena are sufficient to prove this, and the phenomena furnish conclusive evidence of the contention that the sympathetic system provides the means of conducting afferent impulses from the heart. The afferent impulses in this case reaching the inferior cervical ganglion have undoubtedly separated at that point and taken two different paths, one, as already mentioned, proceeding up by means of the spinal cord to the cerebrum, while the other has passed up the gangliated cord through the middle into the superior cervical ganglion, whence fibres pass to the unstriped fibres of the

<sup>1</sup> *Op. cit.*, Vol. XVI., p. 126.

levator palpebræ superioris, to the muscle of Müller, and to the radiating fibres of the iris, accounting for the elevation of the eyelid, the protrusion of the eyeball, and the dilatation of the pupil.

The causes of the impulses, whose course has been traced, are certainly numerous. Aortic, coronary, and myocardial lesions lead to secondary changes by interfering with the nutrition of the heart muscle. This may occur either by diminution of the blood supply, long ago suggested by Allan Burns,<sup>1</sup> or by direct irritation of the sensory nerve endings. Pericardial affections, aneurysms, and tumours occasionally produce symptoms like angina pectoris; but they are, as a rule, not so definite. Further, there can be no doubt that cardiac stress, leading to strain, originally mentioned by Cahen<sup>2</sup> and Eichwald,<sup>3</sup> may, in the absence of distinct structural alterations, produce a considerable degree of cardiac pain. A recent paper of Mackenzie's<sup>4</sup> gives a most excellent summary of our present knowledge of this aspect of the subject. He concludes that angina pectoris will, in all probability, be found to depend upon impairment of the function of contractility. Toxic influences can easily be understood as factors giving rise by irritation to considerable discomfort. Reflex action, taking its origin even in the most distant parts of the body, is by no means an uncommon cause of cardiac pain, acting, as it does, by increasing the strain on the heart. In this connection, it may be added that Russell<sup>5</sup> lately, in a very interesting paper, described the relation of angina pectoris to reflex action of abdominal origin. Vasomotor, neurasthenic, and hysterical causes are much less common, excepting in association with structural alterations, with which they are sometimes conjoined. It is not possible to leave this subject without referring to the views of Clifford Allbutt,<sup>6</sup> who believes that the essence of angina pectoris is to be found solely in aortic lesions. This is to my mind too narrow a conception of the state of matters. Lastly, let me

<sup>1</sup> *Diseases of the Heart*, 1809, p. 138.

<sup>2</sup> *Arch. gén. de méd.*, 1863, pp. 428, 561, and 696.

<sup>3</sup> *Würz. med. Zeitschr.*, 1863, s. 249.

<sup>4</sup> *Brit. Med. Journal*, 1905, Vol. II., p. 847.

<sup>5</sup> *Brit. Med. Journal*, 1906, Vol. I.

<sup>6</sup> *The Cavendish Lecture*, London, 1903, p. 17.

add that the blood pressure may be high, as originally proved by Brunton,<sup>1</sup> or low, as was first demonstrated by Morison,<sup>2</sup> but in the largest proportion of cases the pressure is high in relation to the strength of the heart.

Passing by all questions of diagnosis as well as of prognosis, let me say a few words as regards the treatment of angina pectoris. The first point, which will always demand consideration, is whether there are any underlying conditions inducing or influencing the symptoms. In particular it is always advisable to investigate the condition of the abdominal viscera, seeing that catarrh of the mucous membrane and distension of the visceral walls are so often the reflex causes of attacks, while dilatation of the stomach and intestines is sometimes also a direct mechanical source of disturbance. Similarly when the pulmonary circulation is interfered with, so as to increase the stress upon the right side of the heart, there are apt to be some distressing results. On the other hand, any diminution of excretion, by skin or kidney, leads to troubles for the left side of the heart, through increase of blood pressure. Each and all of these possible factors must be thoroughly investigated. Again, the amount of exertion, physical and mental, should be carefully estimated. All deviations from healthy conditions must be obviated or relieved according to circumstances, both as regards immediate results and further contingencies.

Our first duty, when called to see anyone suffering from a paroxysm of angina pectoris, is to relieve it with as little delay as possible. Seeing that in the majority of cases the condition is associated with at least a relative high arterial pressure, drugs which lessen the resistance are of great importance. The most useful of these are the nitrites and the iodides. The nitrites of amyl and butyl—more exactly isoamyl and isobutyl—have long had a well merited vogue for relieving the symptoms. Amyl nitrite is pre-eminently useful, and, when administered in a dose sufficient to produce well marked physiological effects, it cannot be surpassed. Butyl nitrite, although of more recent introduction, and therefore of less assured utility, appears to produce very beneficial effects also.

<sup>1</sup> *Lancet*, 1867, Vol. II., p. 97.

<sup>2</sup> *Edin. Hosp. Reports*, 1895, Vol. III., p. 250.



Both may be administered in doses of from three to five minims, the most convenient means of administration being glass capsules. It is difficult, if not impossible, to decide *a priori* the relative utility of these drugs. Their effects are undoubtedly dependent to a great extent upon personal idiosyncrasies.

Ethyl iodide, otherwise known as hydriodic ether, is also of considerable value, administered by inhalation in doses of five minims; glass capsules containing this dose may be employed. So far as can be ascertained, the action of this drug is due to the liberation of free iodine, which is rapidly absorbed by the blood. It is impossible to foretell in any given case whether the nitrite or iodide series will be most useful, and the value of these drugs can only be judged by their results. It is unfortunate that all of them frequently leave headache and giddiness behind them. A very serviceable combination is supplied in capsules of ethyl iodide and chloroform, each containing five and ten minims respectively of the two drugs. The chloroform has certainly, in my own experience, lessened the discomfort produced by hydriodic ether.

The exhibition of powerful alcoholic stimulants by the mouth is often urgently called for; brandy, whisky, spirit of ether, spirit of chloroform, and aromatic spirit of ammonia are all eminently useful in this connection. It may even be necessary to give the patient such general anæsthetics as chloroform or ether by inhalation. Sometimes the subcutaneous administration of morphine is absolutely necessary. The application of heat to the chest externally is often useful, and respiratory movements certainly alleviate the suffering in many cases. It need hardly be added that the patient must be placed in such a position as will be most easy and comfortable, while an abundant supply of fresh air must be secured. If the sufferer can be induced to inspire deeply, he will often obtain relief.

When we consider preventive treatment, we find it necessary to lay down full directions regarding the general measures to be followed. The diet must be so regulated as to prevent any digestive embarrassment, particularly flatulent distension; the fluid must be ample, so as to ensure proper metabolic changes, but it should not be given with meals;



sufficient exercise must be enjoined, so as to stimulate not only the muscles but every other part of the body; adequate rest should be secured, so as to provide for recuperation; occupation must be provided, in order to prevent the mind lingering upon the distressing symptoms of the affection; sleep enough to provide for complete restitution of every system will have to be ensured—these general measures will require full attention, and many little details, which cannot be mentioned here, will demand sedulous care.

Respiratory movements cannot be over-estimated; their value for those able to take advantage of them is very great. In certain cases, however, when the patient is unable to take active exercise, massage must be adopted. With regard to such matters, you will allow me to express my own conviction that the Swedish system of massage and exercises is very much more useful than any other method.

In dealing with the medicinal treatment of angina pectoris, it has to be remembered that, with a complex causation, there must be considerable difference in management. As regards organic types of the affection, it may be necessary to use remedies which will modify metabolism, and act as alteratives; amongst such drugs there are none to compare with the iodides. Undoubtedly the efficacy of these drugs is entirely due to their power of removing morbid products. Iodide of potassium and iodide of sodium are the most useful of these remedies, and one or other may be combined with arsenic, both to prevent the tendency to iodism, and to obtain the specific influence of arsenic itself. If these iodides cannot be tolerated, as occasionally occurs, hydriodic acid, in the form of the syrup, may be administered.

If the pulse pressure has a tendency to be relatively too high, one of the vaso-dilators should be administered; nitroglycerin is the most valuable of all these. It may be given in a dose of from  $\frac{1}{200}$  to  $\frac{1}{50}$  gr. The 1 per cent. alcoholic solution and the tablets afford easy methods of administration. The drug, if necessary, may be given hypodermically; the preparation most commonly used being 25 minims of the trinitrin solution, with 10 minims of 90 per cent. alcohol, and 35 minims of distilled water; of this from 1 to 4 minims may be administered hypodermically for a dose.

Erythrol tetranitrate, or tetranitrin, is often used in doses of from  $\frac{1}{2}$  to 2 grs., while manitol pentanitrate, or pentanitrin, and mannitol hexanitrate, or hexanitrin, have been used in recent years, in the same doses as we use in the case of nitroglycerin ; they are, however, not to be compared with it.

In all cases where the heart shows any tendency to falter, or in which it is relatively weak compared with the pressure it has to overcome, the management will necessarily be to all intents and purposes that of cardiac failure ; sufficient rest with graduated exercises and such cardiac tonics as strophanthus with nux vomica are to be recommended. In the toxic cases of cardiac pain, the elimination of the poison, the restoration of the cardiac energy and the recovery of the nervous system are the points to be borne in mind. In the case of chemical poisoning, whether due to alcohol, tobacco, or tea, further enjoyment of the poison must be prevented. In such cases a considerable lapse of time is necessary, and continued rest with massage, succeeded by respiratory exercises, and followed by graduated exertion will be necessary.

Practically the same line of treatment is necessary in gouty conditions, but the specific for such states is colchicum, which, along with alkalis, will speedily bring about improvement. In instances of influenzic or diphtheritic angina, the best treatment undoubtedly is the same as has been suggested for the chemical poisons. In some cases the use of appropriate baths is indicated ; along with such means the employment of strychnine promises the best results.

In order to remove reflex angina pectoris, the cause of the disturbance must be ascertained, while at the same time the bromides or hydrobromic acid will lessen reflex irritation. The vasomotor type of the affection is best treated by means of the nitrites, but thyroid extract has, in my hands, produced considerable improvement in cases manifesting symptoms like those of Raynaud's disease.

Lastly, the neurasthenic and hysterical varieties must be dealt with as part of the general conditions in which the symptoms arise, and the modern treatment of such conditions produces, as a general rule, most satisfactory results.

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